Investigating Adherence to an Online Intervention for Major Depressive Disorder in Cancer Patients.

Research Thesis

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By

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Introduction

Cancer is a common and prevalent disease. It is estimated that at some point in their lifetimes, approximately 40% of men and women will be diagnosed with cancer [1]. The burden of cancer diagnosis, treatment, and the rapid changes in social and interpersonal relationships is striking. For a myriad of reasons, possibly including cancer burden, depression is prevalent in cancer populations. Among cancer patients, major depressive disorder (MDD) has prevalence rates ranging from 10-50%, making a predominant psychiatric disorder [2–4]. However, MDD is often under-diagnosed in cancer patients who experience mild distress and it is even under-diagnosed in patients who experience moderate-severe distress [5, 6]. Even when depression is recognized, it often goes under-treated. It is estimated that nearly half of all cancer patients and/or survivors who are recommended/offered a psychological intervention do not pursue treatment [7]. There is a pressing need to increase the accessibility and facilitate the delivery of interventions.

Of the psychological interventions available, Cognitive Behavioral Therapy (CBT) is the most efficacious psychological treatment for MDD [8–12]. CBT is a manualized short-term therapy that consists of identifying and challenging faulty beliefs and becoming more engaged in enjoyable activities [13]. CBT has also been shown to be effective when adapted to the context of cancer [14–16].

However, CBT and psychotherapies in general [17, 18] have high attrition rates. Studies have found that dropout (or failure to complete a specified portion of the treatment) was predicted by less positive outcome expectancies and by failure to improve early in treatment [19, 20]. It is also the case that those with depression may experience lack of motivation, lethargy, and feelings of hopelessness. Indeed, it has been reported that patients experiencing worse

depressive symptoms, specifically lack of motivation, may terminate treatment prematurely [20, 21]. Furthermore, traditional face-to-face therapies, such as CBT, may not be optimal for cancer patients. Cancer patients have treatment, frequent medical appointments, fatigue, limited mobility, and/or negative associations with clinical settings [22, 23].

The aforementioned issues make web based interventions an appealing alternative for cancer patients with MDD. Specifically, computerized Cognitive Behavioral Therapy (cCBT) is a scalable treatment for depression [24–27]. Additionally, cCBT is as effective as face-to-face therapy [28–30]. Several studies report patient satisfaction with computerized Cognitive Behavioral Therapy to be on par with, and in some instances higher, than CBT administered face-to-face [27, 31]. Furthermore, internet interventions can reach a wider range of patients, especially ones ill and burdened with frequent medical appointments and treatments. Therefore, cCBT may be a suitable alternative for cancer patients with MDD.

However, cCBT is plagued by some of the same adherence issues associated with face-to-face treatment. In a meta-analysis examining 16 computerized CBT's for mild-moderate depression, dropout ranged from 0-75% with a weighted average of 31.75% dropout [32]. Predictors associated with decreased adherence to online interventions include higher baseline rates of depression, co-morbid anxiety symptoms, poorer knowledge of psychological treatments, lower education level, older age, and being of the male gender [33, 34]. It is worth noting that studies differ regarding the significance of age and education level. For instance, one study found younger age to be associated with increased adherence and education level to be non-associated, while another study found older age and a higher education level to be associated with increased adherence [33, 34]. Although there are only a few studies that specifically examine reasons for dropout and even fewer studies that use formal measures, qualitative studies

suggest that lack of recognition of depressive symptoms, dislike of treatment content, and the time commitment of treatment may also be potential reasons for treatment dropout [35, 36]. Indeed, many studies have highlighted the importance of studying adherence [33–35, 37] as it is important to optimize cCBT and to determine which populations would most benefit from this intervention. Importantly there is a lack of research examining cCBT efficacy and adherence in cancer populations specifically.

Therefore, this study used mixed methods (qualitative and quantitative) to study adherence to cCBT for cancer patients with Major Depressive Disorder. Aims are as follows:

Aim 1: To examine patient sociodemographics, psychosocial measures, and physical symptom measures at baseline to contrast patients who completed and those who did not complete the treatment. Therefore, it was hypothesized that participants with more severe depression and worse physical functioning would be less adherent to cCBT.

Aim 2: To determine if any group differences or reasons for dropout are cancer specific. It was hypothesized that differences between adherent to treatment and nonadherent groups would include cancer related factors.

Aim 3: To interview nonadherent patients using a semi-structured interview that explores reasons for dropout. It was hypothesized that qualitative data would demonstrate that factors contributing to dropout focus on program content (i.e. lack of cancer specific material, initial sessions not engaging) and would be cancer related.

Methods

Design

The study is a randomized control trial with repeated measures testing an online depression intervention for cancer patients with major depressive disorder randomized to depression treatment versus waitlist control. Patients were randomized within three strata, each with two levels: sex (male/female), comorbid psychological disorder (yes/no), or prior MDD diagnosis (yes/no). The primary outcome was adherence. Longitudinal data consisted of a baseline assessment of online self-report questionnaires and self-report questionnaires measured weekly throughout the 8-week treatment and/or the 8-week waitlist period. Follow-up assessments were administered at 2, 4, and 6 months. Including baseline, there were a total of 12 time points for the treatment arm and 20 time points for the waitlist arm which crossed over to the treatment arm after 8 weeks.

Participants

Participants (n=31) were mostly female (84%), Caucasian (90%), and older (M=55.29; SD=11.96; range = 27 - 79). All participants held a high school degree and 94% completed some college. The majority were employed (74%) and in a relationship with a significant other (71%). Participants were mostly cancer survivors (68%), but 32% were in cancer treatment at the time of enrollment. For those who had completed cancer treatment, the average years since a cancer diagnosis was 7.1 years (SD=9.85; range = 0-47 years). A variety of cancer types were included in this study. See Table 1 for demographic characteristics.

Procedures

Eligibility criteria included individuals with a current/prior cancer diagnosis, co-morbid MDD without suicidal intent, and access to the internet. Exclusion criteria included previous/current bipolar disorder, psychosis, intellectual disability, alcohol or drug dependence, or any life threatening (< 6 months survival) health condition. Participants were accrued from

oncology provider referral, online platforms (such as facebook and twitter), and via informational pamphlets placed in oncology clinics in an NCI designated Comprehensive Cancer Center.

Interested participants were screened for eligibility via a semi-structured telephone interview that included a Patient Health Questionnaire-9 (PHQ-9) assessment. If they met eligibility and PHQ-9 cut-off criteria (PHQ-9 score greater than 8), they were emailed online self-report questionnaires that included an online consent form. The Assessment for Anxiety Disorders Clinical Interview (ADIS) was completed by telephone.

After screening, participants were notified of their study arm assignment via email and those in the treatment arm were sent a link to the program. All were sent weekly online self-report questionnaire consisting of psychosocial measures (Patient Health Questionnaire-9, Generalized Anxiety Disorder-7, Beck Depression Inventory-II) for 8 weeks. After 8 weeks, wait list patients were sent an online link to begin the cCBT. When treatment was completed, participants received follow-up assessments at 2, 4, and 6 months.

Beating the Blues® (BtB) is an internet-delivered CBT treatment consisting of 8 sessions (approximately 50 min. each). BtB was available 24/7 and could be accessed on computers and tablets. Participants were encouraged to complete one session per week, but the exact timing was defined by the participant. The eight sessions have the following cognitive components: problem definition, automatic thoughts, thinking errors and distractions, challenging unhelpful thinking, core beliefs, and attributional style. The following behavioral components are included: pleasurable activities, distraction techniques, sleep management, graded exposure, task breakdown, and activity scheduling.

Multimedia methods (e.g., video case study vignettes, animations, voice-over, and interactive modules) were incorporated, enabling patients to actively engage with the principles and techniques during the session. Sessions are tailored to each patient (e.g., patients list their problems, select activities that best match their problem). Participants were given homework assignments after each session to practice skills. Each session began with a review of the previous session and a check on homework completion, continued with an introduction to the next treatment principle, and ended with a homework assignment for the next week (e.g., problem diaries, thought records, behavioral experiments).

Weekly progress reports, including self-report measures, were used to monitor progress and symptom severity by a licensed Ph.D. clinical psychologist (M.Ryba), checking for worsening of depressive symptoms or other safety concerns. Each participant was assigned a "coach" after starting the BtB treatment. Coaches were undergraduate students and Ph.D. students in the Stress and Immunity Cancer Project group who kept in contact with the participant throughout the treatment. Coaches helped the participant learn how to use the program and sent email and phone reminders to complete sessions; the coaches did not provide therapy. All coaches scheduled a weekly phone call with their participant for the duration of the 8 sessions and answered intermittent questions through email. All coaches were trained according to this protocol and were supervised by clinical psychologist (M. Ryba). Furthermore, a detailed log of coaches' activities was maintained. The log included details such as day, time, length, and content of phone calls; day and number of email contacts; number of sessions completed.

Qualitative Data. Participants were considered "non-completers" if they completed less than 4 of the 8 Beating the Blues® sessions. Those identified as "non-completers" were

contacted starting in March 2018. Participants were called by undergraduate or graduate members of the Stress and Immunity Cancer Projects who had not acted as a coach to the participant being contacted. A brief semi-structured interview focusing on reasons for non-adherence (e.g. cancer-related barriers, technical issues, program content and procedure barriers, time barriers, and changes in depressive symptoms) was developed. See Appendix A for full interview. Interviews were recorded using a Olympus Digital Voice Recorder VN-4100PC and transcribed by undergraduate students working in the Stress and Immunity Cancer Projects Lab. Interviews were rated and themes of non-adherence for this study were formed and refined. Data collection is ongoing.

Measures

Adherence Outcome. Participants defined as "non-completers" completed less than 4 of the 8 sessions. "Completers" completed 4 or more sessions. These cut offs were based on the minimum number of sessions needed to see improvement. "Sudden gains" literature suggests that 42-50% of sudden gains, or large symptom improvements between one treatment interval, occur within the 1st third of treatment [38, 39].

Patient Reported.

Psychosocial Measures

Patient Health Questionnaire-9 (PHQ9) – The PHQ9 [40] is a 9-item self-report scale that is commonly used to screen patients for depression. Questions address depression severity, symptomology, and functional impairment (e.g. "In the past two weeks, how often have you been bothered by little interest or pleasure in doing things?"). Item scores range from 0 (not at all) to 4 (nearly every day). Items are totaled and scores can range from 0-27 with higher scores being indicative of greater symptomology.

Beck Depression Inventory–II (BDI-II) [41] is a 21 item self-report scale measuring symptoms of depression. Questions address depression symptomology (e.g. guilty feelings) and functional impairment (e.g. loss of interest in sex). It is rated on a 4-point Likert scale. Items are totaled and scores range from 0-63 with higher scores indicating greater symptomology.

Generalized Anxiety Disorder-7 (GAD7) – The GAD-7 [42] is a 7-item self-report measure based on the DSM-IV diagnostic criteria for generalized anxiety disorder. Questions assess anxiety severity, symptomology, and functional impairment (e.g. "in the past two weeks, how often have you been bothered by not being able to stop or control worrying?"). Item scores range from 0 (not at all) to 4 (nearly every day). Items are totaled and scores range from 0-21 with higher scores indicating greater symptomology.

The Profile of Mood States (POMS) – The POMS [43] is a 37-item self - report inventory used to assess negative mood. Questions address six mood subscales: Anxiety ("Did you feel on edge?"), Depression ("Did you feel blue?"), Anger ("Did you feel furious?"), Vigor ("Did you feel full of pep?"), Fatigue ("Did you feel exhausted?"), and Confusion ("Did you feel forgetful?"). Item scores range from 0 (not at all) to 4(extremely). Subscales are totaled to yield a Total Mood Disturbance score. Scores can range from -32 to 200 with a higher score indicating greater mood disturbance.

Center for Epidemiological Studies Depression Scale (CES-D) – *T*he CES-D [44, 45] is a 20-item self-report measure used to identify symptoms of depression during the past week. Questions address symptoms such as restless sleep, poor appetite and feeling lonely (e.g. "I felt that people disliked me"). Item scores range from 0 (rarely or none of the time) to 3 (most or all

of the time). Items are totaled and scores range from 0-22 with higher scores reflecting greater levels of depressed mood.

Brief Coping Orientation to Problems Experienced (Brief COPE) – The Brief COPE [46] is a 28-item self-report measure used to assess problem-focused strategies. Questions address strategies such as planning and seeking social support (e.g. "I've been trying to come up with a strategy about what to do") as well as emotion-focused strategies such as turning to spirituality or religion and substance use (e.g. "I've been blaming myself for things that happened"). Item scores range from 0 (not at all) to 3 (a lot). The COPE consists of fourteen subscales, calculated by summing responses to items. Possible score ranges are 0-6. Two factor scores, (Engagement and Disengagement Coping) are calculated by averaging subscale scores. A higher score indicates a greater use of that strategy.

Social Network (SNI) – The SNI [47] is a 10-item self-report measure used to measure an individual's social ties and involvement within her social network. Questions address 4 major components: marital status (currently married versus not), number of close friends and relatives (by category reported number), and frequency of monthly contacts with these individuals (by categorical response), church group membership (yes versus no), and membership in other groups (yes versus no). Intimate contacts are weighted more heavily than church affiliations and group memberships in the calculation of the SNI. SNI scores range from 1-12 with higher scores representing greater social involvement.

The Impact of Events Scale (IES) – The IES [48] is a 22-item self-report questionnaire used to assess traumatic thoughts and behaviors in response to traumatic events. This measure was adapted to address cancer diagnosis/treatment. Individuals rate frequency of feelings or events during the past week (e.g. "I thought about my cancer diagnosis when I didn't mean to"),

using a 5-point Likert scale ranging from 0 (not at all) to 4 (extremely). Scale scores are formed for 3 subscales, which reflect intrusion, avoidance, and hyperarousal. The 3 subscales are totaled and scores range from 0-88 with higher scores reflecting greater cancer related distress.

Physical Symptoms Measures

Medical Outcomes Study Short Form (SF-36) – The SF-36 [49] is a 36-item self-report questionnaire used to assess health and functional status. It measures two major health concepts (Physical and Mental Health) and includes eight subscales: physical functioning, role disability - physical problems, bodily pain, health perceptions, vitality, social functioning, role disability - emotional problems, and mental health. Questions ask about functioning in the past four weeks (e.g. "During the past four weeks, how much of the time have you had a lot of energy?"). Item scores range from 0 (all of the time) to 4 (none of the time). Raw scores are linearly transformed to 0 to 100 scales, with 0 and 100 assigned to the lowest and highest possible values, respectively. Higher transformed scores indicate more optimal functioning.

Fatigue Symptom Inventory – Revised (FSI) – The FSI [50] Is a 7-item self-report measure used to assess the degree of fatigue. Questions addressed the frequency, severity, and daily pattern of fatigue as well as its impact on ratings of quality of life during the previous week (e.g. "Rate how much in the past week fatigue interfered with your enjoyment of life"). Item scores are on an 11-point Likert scale, ranging from 0 (no interference) to 10 (extreme interference). Items are totaled and scores range from 0 to 70 with higher scores indicating greater fatigue.

Pittsburg Sleep Quality Index (PSQI) – The PSQI [51] is a self-report assessment composed of 19 self-rated questions. The PSQI generates seven scores that correspond to the following domains: Subjective Sleep Quality, Sleep Latency, Sleep Duration, Habitual Sleep

Efficiency, Sleep Disturbances, Use of Sleep Medications, and Daytime Dysfunction. Each component was scored from 0 to 3. Component scores were summed to produce a global score (range of 0–21). A PSQI global score >5 is suggestive of significant sleep disturbance.

Qualitative. *Non-Completer Interview (NCI)* – The NCI is an 11 item semi-structured interview for participants who completed less than 4 of the 8 BtB sessions. The interview focuses on cancer-related barriers, technical issues, program content and procedure barriers, time barriers, and changes in depressive symptoms. The interview includes verbal ratings of 0 (not at all) to 6 (greatly) on the impact of a variety of issues that may affect adherence. An open-ended question on ways to improve Beating the Blues is also included. The NCI can be directly compared to the Beating the Blues Exit Interview, but also contains additional adherence focused questions.

Beating the Blues Exit Interview (BtB-EI) – The BtB-EI is a brief 5-item interview assessment for participants who were considered "completers" to provide feedback about the Beating the Blues program. The interview includes verbal ratings of 0 (not at all) to 6 (greatly) on the impact of both obstacles and helpful portions of the treatment. An open-ended question on ways to improve Beating the Blues is also included.

Analytic Strategy

To examine differences in adherence groups, independent samples t tests and Chi-squared tests were completed. Independent samples t tests were conducted to compare baseline measures of depression (PHQ-9, BDI-II), anxiety (GAD-7), mood (CES-D, POMS-SF), coping (Brief COPE), impact of cancer (IES), physical symptoms (FSI, PSQI, SF-36), social support (SNI), age, education, and years since cancer diagnosis in treatment completers versus non-completers. Chi-squared tests were performed to determine if there were differences in history of MDD,

comorbid psychological disorders, prescription use for depression, sex, marital status, employment, ethnicity, and treatment arm in completers versus non-completers.

Results

Of the 48 people screened, 31 (65%) were deemed eligible and completed the baseline questionnaire. Of the 31 participants who completed the baseline questionnaire, 17 were randomized to the intervention arm and 14 were randomized to the waitlist arm. See flow diagram in Figure 1.

Of both the intervention and waitlist arm, 6 people did not attempt to access the Beating the Blues website and 4 people registered with the program, but did not complete any sessions. Of the intervention arm and people from the waitlist arm who moved on to the intervention,13 people started the program and completed at least one session, but did not complete the total 8 sessions. 8 participants completed all 8 sessions of the Beating the Blues program. The distribution of total sessions completed can be seen in Figure 2. Completers (n=12) were defined as having completed 4 or more session. Non-completers (n=19) were defined as having completed less than 4 sessions, thus making dropout from the Beating the Blues program 61%.

When comparing baseline self-report measures of non-completers to completers, non-completers had higher PHQ-9 scores (M = 13.21, SD = 5.50) compared to completers (M = 10.08, SD = 2.97; t(31) = 2.05, p = 0.05). As can be seen by the frequencies cross tabulated in Table 3, there is a significant relationship between adherence and a previous major depressive episode, X^2 (1, N = 31) = 5.985, p< .025.

All other self-report measures and sociodemographic data gathered at baseline were non-associated. However, completers had a mean Engage Cope score of 3.52 while the non-

completers had a mean Engage Cope score of 2.47 ($t(31) = 1.99$, $p = 0.057$) suggesting that completers used more engagement focused coping strategies on average.

Notably, self-report measures and sociodemographic factors related to cancer burden such as the Impact of Events scale, years since cancer diagnosis, and current cancer treatment at time of enrollment in study were not associated with adherence. In addition, physical factors such as fatigue, sleep quality, and overall physical health were not associated with adherence. These results can be seen in Table 2.

Qualitative data demonstrated that factors contributing to dropout focus on time constraints and negative life events. Multiple participants noted that it was difficult to complete sessions while also working and attending to family obligations. For example, one participant said "It was time consuming, that was a big negative for me and probably why I struggled with using it, that would be my only reason. Other than that, it was very user friendly." In addition, several participants experienced negative life events (i.e. "Well… she (their mother) forced him (their father) to put me and my kids out on the street") which led to major upheaval and a shift in priorities. Overall, the perception of Beating the Blues and online interventions in general was positive. For instance, one participant said that "I really liked it (Beating the Blues). I walked away from it, telling all my friends about it and talking about the things I had learned during my sessions, so very positive." More selected quotes can be found in Appendix B.

Discussion

This study examined adherence to a computerized cognitive behavioral therapy for cancer patients major depressive disorder. Dropout from the intervention was high (61%) but was within the range of other trials of cCBT (0-75% dropout) [32]. We examined group differences in sociodemographic, health, and mood self-reports at baseline for completers and

non-completers. We initially hypothesized that those with more severe depression would be less adherent. Indeed, it was found that those having more severe depressive symptoms and having a history of major depressive disorder were more likely to be non-adherent. It is worth noting that completers had higher mean Engage Cope scores compared to non-completers. It was hypothesized that those with worse physical functioning would be less adherent to treatment. However, all measures of physical functioning were non-associated. Cancer specific factors such as the Impact of Events Scale, years since diagnosis, and being in cancer treatment during the study were not associated with adherence, contrary to our initial hypothesis. In addition, all other sociodemographic factors and self-report data were nonsignificant.

The finding that worse depressive symptoms were correlated with non-adherence has been recognized in previous literature and was consistent with our hypothesis. In face-to-face CBT treatments, it was found that higher Beck Depression Inventory scores were correlated with premature termination of treatment [21] and in a systematic review of internet interventions it was found that increased MDD/anxiety severity lead to early dropout [33]. However, another review of internet-based treatment for psychological disorders [52] found that patients with less severe difficulties were more likely to drop out of internet based treatment. In addition, a meta-analysis for web-based interventions [34] found that baseline depression severity was not significantly linked to dropout, but when the two measures of depression (CES-D and BDI) were examined separately there was a higher risk for dropout in patients who indicated greater levels of depressed mood on the CES-D at baseline. However, these studies where depression severity was non-associated with adherence did not look at cCBT interventions specifically and only one study focused on depression exclusively.

Findings suggest adherent patients may use engagement coping strategies. This finding is consistent with the literature. In a study examining oncologist's abilities to recognize distress in cancer patients, it was found that cancer patients who used a coping strategy of denial was associated with decreased interest in psychosocial support [5]. Furthermore, in a study examining coping strategies when faced with a chronic illness, it was found that patients with more engaged coping strategies were linked to decreased negative affect and better adjustment [53]. Engagement coping strategies focus on managing the stressor and information seeking. Depressed patients who utilize this strategy may be especially suited for a self-guided cCBT which requires a degree of self-motivation.

Cancer specific factors such as the Impact of Events Scale, years since diagnosis, and being in cancer treatment at the time of the study were nonsignificant when comparing differences between completers and non-completers. In addition, measures of physical functioning such as sleep and fatigue were nonsignificant when comparing differences between completers and non-completers. It was hypothesized that patients with worse physical functioning and more cancer related burden would be less adherent, but this was not the case. In the future, determining the appropriateness of cCBT for a population with a chronic illness may depend more on depressive symptom severity than on disease symptom severity.

Factors such as age, education level, and gender which were found significant when predicting adherence rates in other cCBT studies, were not significant in this study of adherence to cCBT in cancer patients. One review of adherence to online interventions found that younger age predicted better adherence and that education was non-associated [33]. In a meta-analysis examining adherence, being male, having a lower educational background, and/or comorbid anxiety was correlated with increased dropout. In addition, the meta-analysis found that older

participants experienced less dropout. [34]. Again, these studies did not look specifically at cCBT and were not conducted in cancer populations. Subsequent studies should focus on examining these factors in other health populations and with a larger power.

Qualitative data collection is still ongoing. From the participants we have successfully contacted, reasons for dropout have centered on time constraints and negative life events. For example, patients have mentioned that in keeping up with daily responsibilities, they forgot to engage with BtB. Regarding negative life events, patients have mentioned that things such as family conflict or the loss of a job contributed to treatment dropout. These results differed from our hypothesis that nonadherent patients may have not identified with the BtB lessons. In fact, the BtB content and website were found to be impactful and easy to use. Furthermore, none of the main reasons for dropout were cancer specific, contrary to our initial hypothesis.

This study lacks the power to definitively identify group differences of participants who completed versus those who dropped out of treatment. Furthermore, the sample demographics are not varied. The population is mostly Caucasian, older, female, and educated, meaning that these results may not generalize to other populations. Furthermore, cancer patients are traditionally an older population, which may make it difficult to look at differences in age between completers and non-completers. Fatigue and problems with memory and concentration are symptoms of both depression and cancer. It is possible that reported depression was not based solely on depressive symptoms, but combined cancer side-effects and depressive symptoms. This may make it difficult to determine if there are cancer specific differences between completers and non-completers.

Future studies with greater power should be conducted in cancer populations to confirm this study's findings. Future studies should explore how to optimize cCBT for patients with more

severe depressive symptoms and a history of MDD. Furthermore, future studies should examine factors and potential interventions that may improve adherence in general. For example, adding a brief lesson focused on engagement coping strategies before beginning an online intervention could improve treatment adherence. CCBT can be useful, but barriers to adherence remain. This study has identified factors that contribute to adherence.

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Table 1. Demographic Characteristics of Study Participants (n=31)

Characteristic		n	%
Gender			
	Male	5	16%
	Female	26	84%
Age			
	20-29	1	3%
	30-39	3	10%
	40-49	5	16%
	50-59	11	35%
	60-69	6	19%
	70-79	5	16%
Ethnicity			
	Caucasian	28	90%
	African American	2	6%
	Asian/Hispanic	1	3%
Education			
	Some high school	0	0%
	High school graduate	2	6%
	Some college	9	29%
	College graduate	11	35%
	Masters/PhD	9	29%
Employed			
	Yes	23	74%
	No	8	26%
Relationship			
	Yes	22	71%
	No	9	29%
Cancer Stage			
	Current Treatment	10	32%
	Survivor	21	68%
Years since Cancer Diagnosis for Survivors (n=21)			
	0-9	16	76%
	10-19	4	19%
	20-29	0	0%
	30-39	0	0%
	40-49	1	5%

Figure 1. Flow Diagram

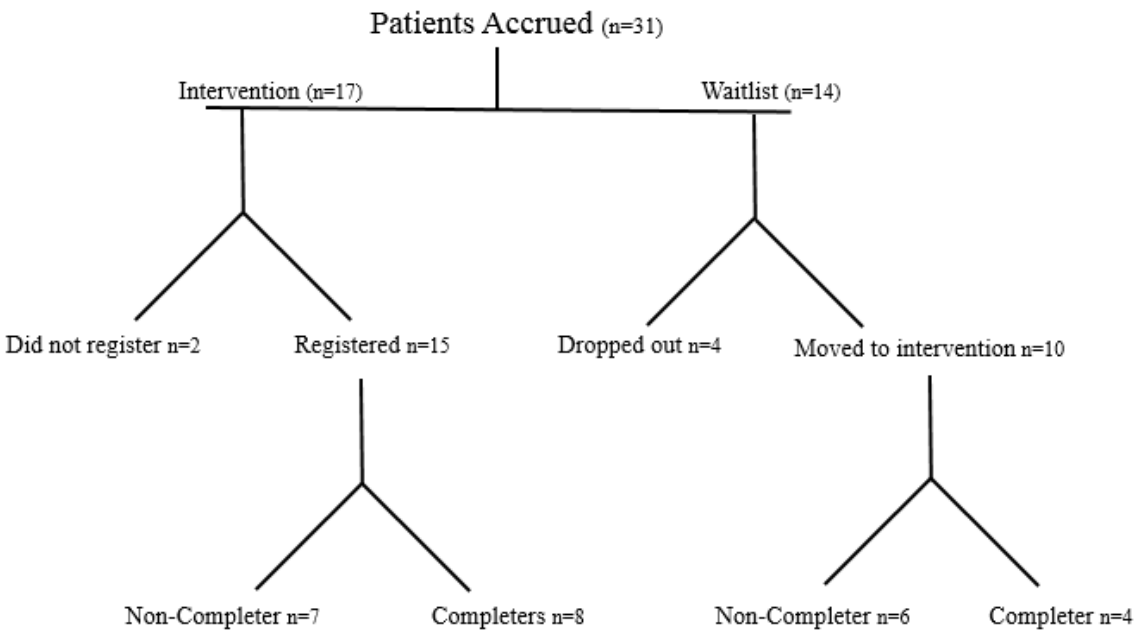

Figure 2. Distribution of Sessions Completed

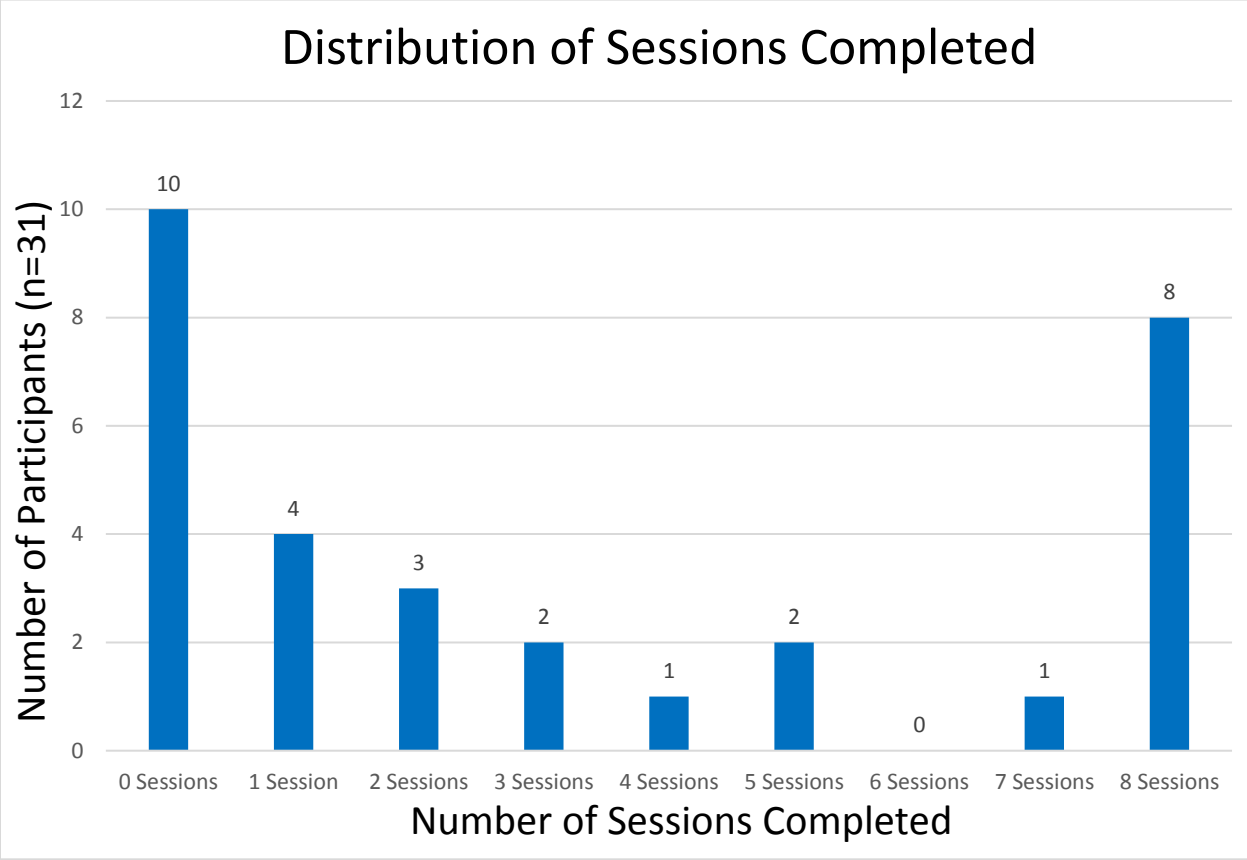

Table 2. Comparing psychosocial measures and demographics between completers and non-completers using independent samples t-test

	Completer		Non- Completer			
	M	SD	M	SD	t-test	p
PHQ9	10.08	2.97	13.21	5.50	2.05	0.05*
BDI	21.00	7.07	26.78	8.39	1.98	0.057
GAD7	9.92	5.33	12.00	4.33	1.19	0.243
POMS Total Mood Disturbance	66.91	35.29	83.11	36.60	1.22	0.234
CESD	26.93	8.88	30.89	8.45	1.25	0.221
Engage Cope	3.52	1.67	2.47	1.26	2.0	0.057
Disengage Cope	0.61	0.80	1.02	0.72	1.47	0.152
SNI	3.09	2.02	2.76	1.25	0.53	0.601
Impact of Events (cancer)	19.67	14.16	21.01	10.75	0.30	0.767
PCS (Physical health SF-36)	44.44	10.92	44.46	12.27	0.005	0.996
MCS (Mental health SF-36)	29.67	6.88	29.48	7.20	0.072	0.943
Fatigue	34.50	13.96	36.74	14.93	0.42	0.680
PSQI Total	11.92	2.15	12.47	2.41	0.65	0.520
Year since Dx	4.67	4.56	7.84	10.75	0.97	0.342
Age	57.00	11.12	54.21	12.95	0.616	0.543
Education (years)	17.42	2.54	16.79	2.04	0.758	0.455

Note. *=$p<0.05$

Table 3. Crosstabulation of completer vs non- completer and previous MDD diagnosis

Completer vs Non- completer	Prior MDD		
	No	Yes	χ^2
Non- Completer	2	17	5.985**
Completer	6	6	

Note. ** $= p, 0.025 \leq 0.025$

Table 4. Crosstabulation of completer vs non- completer and current cancer Tx

Completer vs Non- completer	Current Cancer Treatment		
	No	Yes	χ^2
Non- Completer	13	6	0.010
Completer	8	4	

Appendix A

Exit Interview for BtB Non – Completers

"Hello, my name is _____ and I'm from the Ohio State University. I understand that you were enrolled in something called the Beating the Blues program. It was an online therapy for cancer patients who have depression. We are trying to gather information from previous participants to learn how to improve the program and we are particularly interested in getting the feedback of those that did not complete the full 8 sessions. I would greatly appreciate it if we could take a moment of your time to ask you a couple of short questions to better understand how we could improve this study/program in the future. Additionally, we could schedule a call at a later date if this is an inconvenient time.

1. **What reasons did you have for participating in this study?**

_____
_____
_____
_____
_____

2. **Did you have any issues with setting up your Beating the Blues Account? Were you able to log on?**

_____
_____
_____
_____
_____

3. **What were your first impressions of the Beating the Blues program?**
    i. *Please rate this item using the scale*

Scale: (0 = very negative 3=neutral 6 = very positive)

_____
_____
_____
_____
_____

a. What do you think about online treatments in general?
    i. *Please rate this item using the scale*

Scale: (0 = very negative 3=neutral 6 = very positive)

_____
_____
_____

4. **How difficult was it to complete Beating the Blues in general?**
    i. *Please rate this item using the scale*

Scale: (0 = not difficult 2 = somewhat difficult 4 = quite difficult 6 = very difficult)

_____
_____
_____

a. What issues/obstacles made it difficult for you to complete Beating the Blues?
    i. *Please rate each obstacle using the scale below*

Scale: (0 = not difficult 2 = somewhat difficult 4 = quite difficult 6 = very difficult)

_____
_____
_____

b. What parts of the program were unappealing to you?
    i. *Please rate each part of the program using the scale below*

Scale: (0 = not difficult 2 = somewhat difficult 4 = quite difficult 6 = very difficult)

_____
_____
_____

5. **How easy/hard was it to use Beating the Blues (i.e. navigate the website, log on)?**
    i. *Please rate this item using the scale*

Scale: (0 = not accessible 2 = somewhat accessible 4 = quite accessible 6 = very accessible)

_____
_____
_____
_____
_____

a. What features of Beating the Blues makes it easy to use?

_____
_____
_____

b. Did the anytime/anywhere feature of Beating the Blues make it more or less easy to use?

c. Where did you access Btb? Did you experience any issues with privacy?

d. What technical problems interfered with the usability of Beating the Blues?

6. What is the main reason why you didn't start/complete Beating the Blues?

***Only ask if they completed a session**

7. How helpful was Beating the Blues?

i. Please rate this item using the scale

Scale: (0 = not helpful 2 = somewhat helpful 4 = quite helpful 6 = very helpful)

a. Which Beating the Blues features (narration, video examples, graphics, activities, homework) did you find helpful? What wasn't helpful?

i. Please use the scale to rate any features mentioned

Scale: (0 = not helpful 2 = somewhat helpful 4 = quite helpful 6 = very helpful)

b. What Beating the Blues content (ie thought recording, thinking errors) did you find helpful? What wasn't helpful?

i. Please use the scale to rate any content mentioned

Scale: (0 = not helpful 2 = somewhat helpful 4 = quite helpful 6 = very helpful)

***Only ask if they utilized a coach**

8. **How helpful was your Beating the Blues coach?**
    i. *Please rate this item using the scale*

Scale: (0 = not helpful 2 = somewhat helpful 4 = quite helpful 6 = very helpful)

a. Was your coach able to answer your questions about the program?

b. What aspects of coaching encouraged you to continue the program?

***Ask if they did not utilize a coach**

c. If you did not utilize a coach, what were your reasons for doing so?

9. **How much of an effect did Beating the Blues have on your life?**
    i. *Please rate this item using the scale*

Scale: (0 = no effect 2 = some effect 4 = quite a large effect 6 = a very large effect)

a. Did you seek any other treatment during or after Btb?

10. How would you change/improve the Beating the Blues program?

a. What did you expect that was not included?

b. What would have made the program easier to use?

11. How motivated were you to independently seek treatment before starting BtB, during BtB, and now?

i. Please rate this item using the scale

Scale:
0 = Not motivated at all 2 = Somewhat motivated 4 = quite motivated 6 = very motivated

The following section highlights potential problems, which may have negatively impacted your progress in the program. Please ask if they have experienced each potential problem (yes/no) and if they have, please rate each problem on a scale of 0-6.
(0 = the issue had no impact on progress; 2 = some impact;
4 = considerable impact; 6 = the issue severely impacted progress; NA = not applicable)

	Yes/No	If yes, rate impact on scale of 0-6
1.	_____ Technical difficulties (e.g., issues with logging in)	_____
2.	_____ Doubts about the usefulness of program	_____

3. _____ Discouraged due to slow initial progress _____
4. _____ Did not have enough time (due to other commitments) _____
5. _____ Negative life events (e.g., death in the family) _____
6. _____ Low energy or depressed mood _____
7. _____ Did not remember to use the program _____
8. _____ Felt too impersonal _____
9. _____ Felt that the level of phone support was inadequate _____
10. _____ Felt that the level of email support was inadequate _____
11. _____ Not enough in-person contact _____
12. _____ Concepts were hard to understand _____
13. _____ I would have preferred an alternative treatment (e.g., medication) _____
14. _____ Program did not adequately address depression _____
15. _____ My medical treatment interfered with the program _____
16. _____ My physical health interfered with the program _____
17. _____ I started to feel better _____
18. _____ I was worried how others would perceive my online treatment _____
19. _____ The treatment was perceived as too demanding _____
20. _____ I received help elsewhere _____

13a. If a response greater than 1, which concerns did the program not address?

_____

After the interviewer completes the survey, please quickly look over the interview and label any of the a priori themes that were discussed:

1. Cancer – Related barriers
2. Technical issues
3. Program
    a. Content
    b. Procedures
4. Time
5. Depression Changes

Appendix B

Selected Quotes

Time Constraints

"It was more difficult (to complete BtB) because at the time I was working multiple jobs, and I would get busy with work, go home, have to take care of my family, and I would completely forget that I was supposed to be doing it."

"I actually did like the program, it had good information…I just could not remember to get it done."

"It was hard with my work schedule and the length of the courses…it was hard"

"It was time consuming, that was a big negative for me and probably why I struggled with using it, that would be my only reason. Other than that it was very user friendly."

Opinions of the Program

"I really liked it (Beating the Blues). I walked away from it, telling all my friends about it and talking about the things I had learned during my sessions, so very positive"

"It was always available, and then it was formatted in a way such that even if someone is not tech savvy, it was very easy to navigate through and the resources were there and you could locate them very easily."

"I think it's a good tool to use in addition to other tools"

"There were 3 people that we kind of followed (patient vignettes), I don't know if that was my favorite part of it"

Negative Life Events

"I was in and out of the hospital a few times…during the time I had to have my ovaries out and I was having migraines…and at work I've never been written up for any issues the 4 years that I've been at my company, and when I came back from my mastectomy they wrote me up and said I was having performance issues all of a sudden at work. So that was all going on in the time that I was going through Beating the Blues"

"I was going through…I have a difficult situation with my family…with my parents…well actually with my mother in particular. I bought a house in 2006 and I had to put it in my father's name because after I went through cancer my credit wasn't good. Well… she (her mother) forced him (her father) to put me and my kids out on the street. And I lost like $62,000 I put in to it"